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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/692,725	10/19/2000	Saligrama R. Venkatesh	2810	5618

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EXAMINER	
PIERRE, MYRIAM	
ART UNIT	**PAPER NUMBER**
2654	

DATE MAILED: 12/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/692,725	VENKATESH ET AL.	
	Examiner	Art Unit	
	Myriam Pierre	2654	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *06 September 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *10-51* is/are allowed.

6)☒ Claim(s) *1 and 3-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's arguments, filed 09/06/2005 regarding Office Action of 07/13/2005, the proposed changes are approved by the examiner, canceling claim 2 and amending claims 1, 4-5, and the amending Fig. 1.

Response to Arguments

2. Applicant's arguments filed 09/06/2005 have been fully considered but they are not persuasive.

Applicant argues that Cheng et al. (2003/0018471), now referred as Cheng, fails to teach prima facie obviousness, examiner respectfully disagrees. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Cheng teach " psychoacoustics taken into account is necessarily that the human ear perceives sound at different frequencies on a non-linear mel-scale" (mel frequency scale, page 3 paragraph 24, the "Mel scale" (Bark scale) is well known to provide spectrum resolution for low frequencies than for high frequencies, thus matching more closely the human auditory system, thus, when using the Mel-scale, the human auditory system is taken into account.) and it would have been

obvious to one of ordinary skill in the art at the time of the invention to implement mel-scale in order to sufficiently scale or reduce noise for perceptual frequencies which result in lower computation requirements, as taught by Cheng et al., page 3 paragraph 24.

Applicant argues that Cheng's mel-scale (which is inherently non-linear) is only used for the speech recognizer and does not "hear" sounds the way the human ear perceives sounds at different frequencies, examiner respectfully disagrees. The mel-scale used in Cheng is based on perceptual distortion (Abstract), this distortion is heard by the human ear, each Mel domain minimizes the perceptual distortion (Abstract). Thus, Cheng uses mel-scale to reduce distortion heard by the human ear, thus improving perceptual sound or psychoacoustics.

Applicant argues that Nelson et al. (5,949,894), now referred as Nelson, fails to correct the deficiencies in the rejection of claim 1, examiner respectfully disagrees. Cheng, not Nelson, was used in the rejection of claim 1 and Cheng teach mel-domain error minimization to minimize perceptual distortion..

Applicant argues that Johnson et al. (6,415,253), now referred as Johnson, fails to correct the deficiencies in the rejection of claim 1, examiner respectfully disagrees. Cheng, not Johnson, was used in the rejection of claim 1 and Cheng teach mel-domain error minimization to minimize perceptual distortion.

Claim Rejections - 35 USC § 103

3. Claims 1, and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Finn (WO 98/56208) in view of Cheng et al. (2003/0018471).

As to claim 1 Finn teaches

a microphone for receiving the spoken voice and the ambient noise for necessarily converting the spoken voice and the ambient noise into an audio signal (page 6 lines 20-25, page 8 lines 23-24, page 12 lines 1-10).

a speech enhancement (acoustic echo cancellation) filter for removing the second component from the audio signal to provide a filtered audio signal, said speech enhancement filter removing the second component by processing the audio signal (acoustic echo cancellation, page 5 lines 12-18; acoustic echo cancellation removes second component (noise) from fed back and processes the audio signal (determining received spoken voice); and

a loudspeaker for outputting a clarified voice in response to the filtered audio signal (col. 12 line 5, Fig. 1 elements 85 and 75).

Finn does not teach non-linear mel-scale.

However, Cheng et al. do teach non-linear mel-scale inherently responsive to the way human ear perceives sound at different frequencies (Abstract and page 3 paragraph 24).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement a non-linear mel-scale of Cheng into the cabin communication of Finn because Cheng et al. teach that mel-domain minimization minimizes perceptual distortion and reduces computation requirement to provide suitably filtered audible information, Abstract.

As to claim 4, which depends on claim 1, Finn does not explicitly teach speech is anti-causal and noise is causal.

However, Cheng et al. do teach the method is further responsive to the way that speech is anti-causal and noise is causal (non-causal finite impulse response, page 4 paragraph 34, non-causal finite impulse response applies to the filter which convolutes the noisy audible signal and the non-causal finite impulse response, thus the non-causal impulse response is necessarily applied to speech and causal to noise).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the anti-causal and causal speech of Cheng into the method of Finn, because Cheng et al. teach that this would produce the first stage enhanced speech signal, page 4 paragraph 34.

4. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Finn (WO 98/56208) in view of Cheng et al. (2003/0018471), as applied to claim 1, in further view of Johnson (6,415,253).

As to claim 3, which depends on claim 1,

Finn in view of Cheng et al. do not explicitly teach smoothing a spectrum over larger windows.

However, Johnson does teach

wherein said speech enhancement filter smooths a spectrum of the audio signal over larger windows at higher frequencies (col. 4 lines 34-36, 49-54; col. 6 lines 4567 and col. 12 lines 51-56)

Therefore, it would have been obvious to one of ordinary skill in the art to implement the smooth audio signals over larder windows at higher frequencies of Johnson into the method of Finn in view of Cheng et al., because an artisan of ordinary skill in the art would have reduced peaks in the noise spectrum caused by the random nature of the noise (Johnson col. 4 lines 49-54).

5. Claims 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Finn (WO 98/56208) in view of Cheng et al. (2003/0018471), as applied to claim 4 above, in further view of Nelson et al. (5,949,894).

As to claim 5, which depend on claim 4, Finn in view of Cheng et al. do not explicitly teach filtering the audio signal with a causal filter.

However, Nelson et al. do teach

speech enhancement filter filters audio signal with a causal filter (impulse response of filter is constrained to be causal, col. 3 lines 32-35).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the causal filtering of Nelson et al. into the method of Finn in view of Cheng et al., because an artisan of ordinary skill in the art would have designed a causal filter in order to minimize the time averaged squared error between the filter output and the "desired" filter output, (Nelson et al. col. 3 lines 33-35).

As to claim 6, which depend on claim 5, Finn in view of Cheng et al. do not explicitly teach filtering with a causal Wiener filter.

However, Nelson et al. do teach causal filter is a causal Wiener filter (col. 3 lines 32-35, col. 3 line 32 and Fig. 17).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement filtering with a causal Wiener filter as taught by Nelson et al. because this would minimize the time averaged squared error between the filter output and the "desired" filter output (Nelson, col. 3 lines 34-35).

As to claim 7, which depend on claim 6, Finn in view of Cheng et al. do not teach Wiener calculations via weighted least squares.

However, Nelson et al. do teach Wiener calculations via weighted least squares (col. 3 lines 28-33 and col. 4 line 57).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement Wiener calculations via weighted least squares in taught by Nelson et al. into the method of Finn in view of Cheng et al. because an artisan of ordinary skill in the art would minimize the time averaged squared error between the filter output and the "desired" filter output, (Nelson, col. 3 lines 34-35).

Finn in view of Cheng et al. does not explicitly teach weighted least squares as an inverse proportional to an energy in a respective frequency bin.

However, Nelson et al. does teach weighted least squares as an inverse proportional to an energy in a respective frequency bin (inverse filtering using a least squares formula, col. 3 lines 26-30).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the weighted least square as the inverse proportional

to an energy in a frequency bin as taught by Nelson et al. into the method of Finn in view of Cheng et al. because an artisan of ordinary skill in the art would restore the signal for further processing (Nelson, col. 3 lines 26-30).).

6. Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Finn (WO 98/56208) in view of Cheng et al. (2003/0018471), as applied to claim 1 above, in further view of Johnson (6,415,253).

As to claim 8, which depend on claim 1, Finn in view of Cheng et al. does not explicitly teach temporal smoothing of a Wiener filter calculation.

However, Johnson does teach speech enhancement filter uses temporal (broad) smoothing of a Wiener filter calculation (frequency spectrum components are filtered using a broad smoothing filter for silent state, smoothing coefficients used for the Wiener filter, col. 4 lines 33-35 and 65-67).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention implement temporal smoothing of Johnson into the method of Finn in view of Cheng, because an artisan of ordinary skill in the art would have reduced the peaks in the noise spectrum caused by the random nature of noise, (Johnson col. 4 lines 34-36).

As to claim 9, which depend on claim 1, Finn in view of Cheng et al. does not teach frequency smoothing of a Wiener filter calculation.

However, Johnson does teach speech enhancement filter uses frequency (narrow) smoothing of a Wiener filter calculation (narrow smoothing for speech state, col. 4 lines 37-41).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement frequency smoothing of Johnson into the method of Finn in view of Cheng, because an artisan of ordinary skill in the art would avoid smoothing the peaks in the spectrum because it represents voice characteristics and not random fluctuations, thus, the frequency spectrum components are filtered using a narrow smoothing filter (Johnson, col. 4 lines 38-41).

Allowable Subject Matter

7. Claims 10-51 are allowed over the prior art of record. The following is an Examiner's statement of reasons for allowance:

As to claims 10, 13, 16, 25, 37, 40 and 49, Finn (WO 98/56208) teaches filtering.

Finn does not teach nor fairly suggest an enhancement filter for smoothing spectrums comprising of a mel-scale, a causal Wiener and a third filter for temporal smoothing of the Wiener filter, as well as a speech enhancement filter, which removes the first and second components by taking into account the psychoacoustics of a human ear.

Cheng et al. does teach a mel-scale filtering, however, Cheng et al. does not teach a filter which comprises of a causal Wiener and a third filter for temporal smoothing of the Wiener filter.

While mel-scale is taught by Cheng, the prior art of record does not teach nor fairly suggest singularly nor in combination smoothing spectrums comprising of a causal Wiener and a third filter for temporal smoothing of the Wiener filter, as well as a speech

enhancement filter, which removes the first and second components by taking into account the psychoacoustics of a human ear, all of which is not taught nor is it obvious over the prior art.

The dependent claims 11-12, 14-15, 17-24, and 26-27 are allowed because they further limit the independent claims or their parent claims.

As to claims 28, 37, 40, and 49.

Finn (WO 98/56208) teaches echo cancellation but does not teach nor fairly suggest echo cancellation for removing the third filter component, which includes the first and second audio signals, as well as the speech enhancement filter also removing the first and second components by taking into account the psychoacoustics of a human ear.

Cheng et al. teach filtering noise, but does not teach nor fairly suggest echo cancellation for removing the third filter component, which includes the first and second audio signals, as well as the speech enhancement filter also removing the first and second components by taking into account the psychoacoustics of a human ear.

While mel-scale is taught by Cheng, the prior art of record does not teach nor fairly suggest singularly nor in combination echo cancellation for removing the third filter component, which includes the first and second audio signals, as well as the speech enhancement filter also removing the first and second components by taking into account the psychoacoustics of a human ear, all of which is not taught nor is it obvious over the prior art.

The dependent claims 29-36, 38-39, 41-48, and 50-51 are allowed because they further limit the independent claims or their parent claims.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Myriam Pierre whose telephone number is 571-272-7611. The examiner can normally be reached on 8:30-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on 703-308-9645. The fax phone number for the organization where this application or proceeding is assigned is 703872-9306.

9. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

12/05/2005

VIJAY CHAWAN
PRIMARY EXAMINER